

**MID TERM I EXAMINATION, SEM. II, 2025**  
**DEPT. MATH., COLLEGE OF SCIENCE, KSU**  
**MATH: 107 FULL MARK: 25 TIME: 90 MINUTES**

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**Q1. [5]**

Solve the system of linear equations by Gaussian elimination method:

$$3x + 8y + 2z = -5$$

$$2x + 5y - 3z = 0$$

$$x + 2y - 2z = -1$$

**Q2. [5]**

Let

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 2 & 0 \\ 3 & 0 & 1 \end{bmatrix}$$

- (i) Use elementary row operations to determine  $A^{-1}$ .
- (ii) Use  $A^{-1}$  to compute  $(A^T)^{-1}$ .

**Q3. [5]**

- (a) Find all values of  $x$  and  $y$  for which the following matrix  $A$  is symmetric.

$$A = \begin{bmatrix} -2 & x+2y & 0 \\ -1 & 1 & -2x-3y \\ 0 & 4 & 3 \end{bmatrix}$$

- (b) Let  $A$  and  $B$  be square matrices of the same size such that  $A$  is symmetric and invertible. Show that  $BA^{-1}B^T$  is symmetric.

**Q4. [6]**

If

$$A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 1 & 1 \\ -1 & 1 & 0 \end{bmatrix}$$

then show whether the given matrix is invertible, and if so, find adjoint of  $A$ . Also, find  $\det(A^{-1})$ .

**Q5. [4]**

Use Cramer's Rule to solve the following linear system

$$x + y = 1$$

$$x + 2y + z = -1$$

$$x + 3y - z = 2.$$